Knee Surgery, Sports Traumatology, Arthroscopy (2023) 31:373–375
https://doi.org/10.1007/s00167-022-07072-6

EDITORIAL

Combined ACL and anterolateral ligament reconstruction: time to pivot and shift the focus?

John Nyland[1] · Gilbert Moatshe[2] · Robin Martin[3]

Received: 9 June 2022 / Accepted: 11 July 2022 / Published online: 23 July 2022

The incidence of anterior cruciate ligament (ACL) injuries among adolescent athletes has been steadily increasing, with females peaking at age 16 years and males at age 17 years, with rates of 392 ACL tears and 422 ACL tears per 100 000 person-years, respectively [1]. In 2015, Smigielski et al. reported that native ACL morphology was "ribbon-like", becoming more strand or bundle-like as it rotated upon itself [26]. General anatomic ACL reconstruction principles, such as better appreciation of native anatomy, individualizing surgery to patient-specific anatomical variability and functional needs, graft positioning within the native footprint centers, and physiologic tension restoration [12], has led to better transverse plane knee movement control during stressful running–cutting directional change and single leg jump landing movements. Despite these surgical technique advances, alarming failure rates and re-injury rates after ACL reconstruction have been reported, especially in younger people who participate in pivoting sports [28, 29].

A plethora of ACL reconstruction methods and/or supplemental peripheral capsuloligamentous surgical methods have been developed to prevent the excessive internal or external transverse plane tibial rotation that leads to graft failure [7, 17, 19, 22]. This evolution has followed an interesting progression with recommendations shifting from the general need for more medial, to more lateral extra-articular capsuloligamentous reinforcement procedures [17]. As anatomic and biomechanical understanding has improved, peripheral capsuloligamentous and intra-articular knee reconstruction procedures have similarly evolved [5, 12, 17, 26]. In 1983, Losee [15] suggested that transverse plane rotational knee control might best be achieved from the periphery, such as stopping a rotating wagon wheel by grabbing the rim rather than the axle. Over time, however, isolated lateral extra-articular procedures were found to be ineffective at restoring knee kinematics [7], possessing high failure rates [19], and were suspected to increase the risk of lateral tibiofemoral compartment osteoarthritis [22]. In 2013, Claes et al. [5] provided a comprehensive description of anterolateral ligament (ALL) knee anatomy. A consensus paper by Sonnery-Cottet et al. [27] in 2017 suggested that ALL repair or reconstruction may improve the transverse plane rotational stability control provided by ACL reconstruction. The consensus group agreed that since secondary restraint injury often occurs concurrently with acute ACL tear cases, their recognition and repair should be considered to augment the transverse plane rotational knee kinematic control provided by ACL reconstruction [27].

Recently the perceived indications for combined ACL and lateral extra-articular procedures have expanded, particularly regarding what might be considered to be a high re-injury risk patient [2, 11, 16, 27]. This term is often subjective, varying between studies and ultimately, in our opinion, matching a high percentage of young and active patients who seek ACL injury treatment. It is concerning if concomitant lateral extra-articular reconstruction or repair procedures becomes the new standard augmentation for most ACL reconstruction cases [25]. Indications for the inclusion of a lateral extra-articular procedure remains a contentious debate in the research community [10], particularly regarding how much its addition truly adds to the restoration of normal knee kinematics and which patient population benefits from it. Several studies have suggested that appropriate fixation of anatomically placed, and biomechanically competent ACL grafts in most cases restores knee stability, negating the need for any supplemental lateral extra-articular procedures to control rotational instability [4, 8, 20]. Although concomitant lateral extra-articular procedures and ACL reconstruction increase ACL graft survival rates at midterm [2, 11], it has not been

✉ John Nyland
jnyland@spalding.edu

[1] MSAT Program, Spalding University, Louisville, KY 40203, USA

[2] Oslo University Hospital—Ullevål, Oslo Sports Trauma Research Center, Oslo, Norway

[3] Lausanne University Hospital, 1011 Lausanne, Switzerland

found to improve long term patient perceived function, even among high risk patients [16]. These questions, in addition to surgical decision-making complexities, make it very difficult for the low volume surgeon to effectively navigate who should, and who should not be offered the combined procedures, particularly among adolescent athletes.

Perhaps we should slow down and reflect about this. For decades, an almost singular surgical focus has been placed on eliminating multi-planar knee laxity as indicated by a positive pivot shift test. While this is essential for safely returning patients back to sports and improving outcomes, greater individualized attention may need to be placed on the plethora of factors that influence a safe return to sports, including psychological factors and the volume of training/competition tissue loading that induces accumulative microtrauma [3]. Although is it essential to restore normal knee kinematics, greater appreciation for and mitigation of other factors that may increase knee re-injury risk should occur. The current focus seems to be placed more on short-term surgical outcome metrics rather than on more global and highly individualized patient-centered health outcome factors including, but not limited to kinesiophobia, fear avoidance, self-efficacy, self-identity, health locus of control and quality of life, in addition to perceived functional limitations, disabilities, and environmental or personal factors [13]. Given that adolescent athletes are training at greater intensities and frequencies than ever before, there is concern that many will be deemed "high risk" thereby fitting the combined procedure selection criteria, even in the absence of a high grade pivot shift test [27]. Associated with this is the growing professionalism of how many adolescent athletes are currently being trained. At first mention of a Premier or Champions League soccer player undergoing the combined procedure, many parents will likely be demanding the same for their child.

In 1974, the elbow surgeon Dr. Jobe introduced the ulnar collateral ligament reconstruction procedure that is now referred to as the "Tommy John surgery" [14]. Since its inception, use of this procedure has increased to the point, where today almost 25% of all major league baseball pitchers have had the surgery [9]. It was not until 2006 that youth baseball pitch count and frequency limitations were implemented that significantly decreased shoulder and elbow injury rates and severity [23]. Why have similar rules not been considered to monitor adolescent athlete lower extremity joint loading? The goal of surgery is to improve ACL injured patient outcomes and safe return to activities [27]. Of considerable challenge in treating adolescent athletes are the complexities associated with concurrent multi-body system growth, and obsessive sports passion [13, 21]. The intersection of physical, mental and emotional health factors at this highly developmental life phase makes healthcare decisions that might influence long-term quality of life very challenging. As primary prevention interventions have shown at the shoulders and elbows of adolescent overhead throwing athletes [23], greater focus may need to be placed on primary and secondary knee injury prevention programs. By altering training intervals [18, 24] in a manner that better addresses the recovery time needed for lower metabolic rate non-contractile tissues we may better facilitate knee capsuloligamentous tissue microtrauma healing and recovery, particularly among developing athletes [6].

Funding No funding was received for completion of this Editorial.

Declarations

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical approval Not applicable.

Consent to participate Not applicable.

References

1. Beck NA, Lawrence JTR, Nordin JD, DeFor TA, Tompkins M (2017) ACL tears in school-aged children and adolescents over 20 years. Pediatrics 139:e20161877
2. Beckers L, Vivacqua T, Firth AD, Getgood AMJ (2021) Clinical outcomes of contemporary lateral augmentation techniques in primary ACL reconstruction: a systematic review and meta-analysis. J Exp Orthop 8:59. https://doi.org/10.1186/s40634-021-00368-5
3. Chen J, Kim J, Shao W et al (2019) An anterior cruciate ligament failure mechanism. Am J Sports Med 47:2067–2076
4. Chiba D, Gale K, Nishida K et al (2021) Lateral extra-articular tenodesis contributes little to change in vivo kinematics after anterior cruciate ligament reconstruction: a randomized controlled trial. Am J Sports Med 49:1803–1812
5. Claes S, Vereecke E, Maes M, Victor J, Verdonk P, Bellemans J (2013) Anatomy of the anterolateral ligament of the knee. J Anat 223:321–328
6. Davis HG (1867) Conservative surgery. D. Appleton & Co, New York
7. Dodds AL, Gupte CM, Neyret P, Williams AM, Amis AA (2011) Extra-articular techniques in anterior cruciate ligament reconstruction: a literature review. J Bone Joint Surg Br 93:1440–1448
8. Fu FH (2018) Anterolateral structure reconstruction unnecessary with anatomic ACL reconstruction for knee stability. J Bone Joint Surg Am 100:e47
9. Fury MS, Oh LS, Linderman SE, Wright-Chisem J, Fury JN, Scarborough DM, Berkson EM (2021) Return to performance after ulnar collateral ligament reconstruction in major league baseball pitchers. Orthop J Sports Med 9:23259671211035750
10. Getgood A (2022) Editorial Commentary: Indications for lateral extra-articular tenodesis in primary anterior cruciate ligament reconstruction. Arthroscopy 38:125–127
11. Getgood AMJ, Bryant DM, Litchfield R et al (2020) Lateral extra-articular tenodesis reduces failure of hamstring tendon autograft

anterior cruciate ligament reconstruction: 2-year outcomes from the STABILITY study randomized clinical trial. Am J Sports Med 48:285–297
12. Hensler D, Van Eck CF, Fu FH, Irrgang JJ (2012) Anatomic anterior cruciate ligament reconstruction utilizing the double-bundle technique. J Orthop Sports Phys Ther 42:184–195
13. WHO (World Health Organization) (2001) International classification of functioning, disability and health (ICF). WHO, Geneva. https://apps.who.int/iris/handle/10665/42417
14. Jobe FW, Stark H, Lombardo SJ (1986) Reconstruction of the ulnar collateral ligament in athletes. J Bone Joint Surg Am 68:1158–1163
15. Losee RE (1983) Concepts of the pivot shift. Clin Orthop Relat Res 172:45–51
16. Mahmoud A, Torbey S, Honeywill C, Myers P (2022) Lateral extra-articular tenodesis combined with anterior cruciate ligament reconstruction is effective in knees with additional features of lateral, hyperextension or increased rotational laxity: a matched cohort study. Arthroscopy 38:119–124
17. Martin R, Nyland J, Jakob RP (2020) ACL surgical innovation cycles: what goes around, comes around. J ISAKOS 5:334–341
18. Matveyev LP (1964) Problem of periodization the sport training. Fizkultura i Sport, Moscow
19. Neyret P, Palomo JR, Donell ST, Dejour H (1994) Extra-articular tenodesis for anterior cruciate ligament rupture in amateur skiers. Br J Sports Med 28:31–34
20. Noyes FR, Huser LE, Levy LS (2018) The effect of an ACL reconstruction in controlling rotational knee stability in knees with intact and physiologic laxity of secondary restraints as defined by tibofemoral compartment translations and graft forces. J Bone Joint Surg Am 100:586–597
21. Nyland J, Pyle B (2022) Self-identity and adolescent return to sports post-ACL injury and rehabilitation: will anyone listen? ASMAR 4:e287–e294
22. O'Brien SJ, Warren RF, Wickiewicz TL, Rawlins BA, Allen AA, Panariello R, Kelly AM (1991) The iliotibial band lateral sling procedure and its effect on the results of anterior cruciate ligament reconstruction. Am J Sports Med 19:21–24
23. Sakata J, Nakamura E, Suzuki T et al (2018) Efficacy of a prevention program for medial elbow injuries in youth baseball players. Am J Sports Med 46:460–469
24. Selye H (1946) The general adaptation syndrome and the diseases of adaptation. J Clin Endocrinol Metab 6:117–230
25. Shybut TB (2021) Editorial commentary: Extra-articular augmentation is an essential consideration in contemporary anterior cruciate ligament surgery. Arthroscopy 37:1667–1669
26. Śmigielski R, Zdanowicz U, Drwięga M, Ciszek B, Ciszkowska-Łysoń B, Siebold R (2015) Ribbon like appearance of the midsubstance fibres of the anterior cruciate ligament close to its femoral insertion site: a cadaveric study including 111 knees. Knee Surg Sports Traumatol Arthrosc 23:3143–3150
27. Sonnery-Cottet B, Daggett M, Fayard J-M et al (2017) Anterolateral ligament expert group consensus paper on the management of internal rotation and instability of the anterior cruciate ligament—deficient knee. J Orthop Traumatol 18:91–106
28. Webster KE, Feller JA (2016) Exploring the high reinjury rate in younger patients undergoing anterior cruciate ligament reconstruction. Am J Sports Med 44:2827–2832
29. Wiggins AJ, Grandhi RK, Schneider DK, Stanfield D, Webster KE, Myer GD (2016) Risk of secondary injury in younger athletes after anterior cruciate ligament reconstruction: a systematic review and meta-analysis. Am J Sports Med 44:1861–1876